

REMARKS

This amendment is responsive to the Office Action of October 28, 2003. Reconsideration and allowance of claims 1-8 and 10 are requested.

The Office Action

Claims 1 and 10 stand rejected under 35 U.S.C. § 102 as being anticipated by Valenta (US 4,528,450).

Claims 2 and 3 stand rejected under 35 U.S.C. § 103 as being unpatentable over Valenta in view of Farmer (US 3,646,347).

Claims 4-7 stand rejected under 35 U.S.C. § 103 as being unpatentable over Valenta.

Claim 8 stands allowed.

The Present Application

In the present application, signals from each x-ray conversion unit **1** of an array or matrix of conversion units are fed to a corresponding plurality of evaluation units **10**. In each evaluation unit, the signal from the corresponding charge conversion unit is amplified to and fed in parallel and concurrently to both a counter channel **5** and an integrator channel **6**. The counter channel counts the number of charge signals that are detected during a given measurement period. The integrator channel concurrently integrates the total charge of all the signals received during the same measurement interval.

In this manner, two different and independent determinations of the absorbed quantity of x-rays are made. The data processing unit **11** determines the absorbed quantity of x-rays from a combination of the count of radiation events from the counter channel and the total integrated charge from the integration channel. More specifically, when there is very low absorption rate of x-ray quanta, the processing unit determines the absorption rate based primarily on the count of x-ray events from the counter circuit. By contrast, when the absorption rate of x-ray quanta is high, the overall charge integration from all

events during the measurement interval is more accurate and the data processing circuit weights the overall charge integral more heavily. The weighting between the count and the overall charge integral is dynamically weighted in accordance with the absorption rate.

The References of Record

Valenta determines the absorbed quantity of x-rays based solely on an output of an integrator **34**. Valenta includes a path **24** which determines whether the output from the integrator represents a valid signal or radiation event. In path **22**, a differentiator differentiates the output signal and breaks it down into photoresponse pulses. If the photoresponse pulses from the differentiator meet a preselected threshold, they emerge from a threshold detector **28** as a series of pulses. Note that a differentiator typically measures slope. Thus, the amplitude of the output of the differentiator is an indication that the shape of the received pulse. A burst identifier **30** interrogates the threshold detector **28** and determines whether a preselected number of pulses occur within a preselected time period. In the preferred embodiment, the burst detector is looking for three pulses occurring within a 750 nanosecond duration. In this way, the burst identifier can determine whether a pulse of the proper duration to be a valid pulse, whether two events were received overlapping (which would appear as one large pulse and which the integrator would interpret as a single pulse that is twice as large), and the like. If the burst analyzer determines that a valid event has occurred, then the burst identifier **30** issues an enable pulse **44**. The enable pulse permits a pulse amplifier **46** to analyze the output of the integrator **34** (as further processed by a lead network **36** and an amplifier **38**).

Thus, the quantity of received radiation is always determined based on the integration of the charge within the signal from the integrator path **32**. The path **22** is only determining whether an event was valid, which appears to be making this determination based on the duration of the event.

Valenta does not suggest that a quantity of x-rays detected could or should be determined by counting a number of charged signals received from the scintillation crystal and photomultiplier tube conversion unit.

Farmer does not cure these shortcomings of Valenta. Farmer is concerned with determining radiation dose. The Farmer system would be added downstream from the pulse height analyzer of Valenta, if the two were combined. Based on the output of the pulse height analyzer, Farmer determines the dose using the math as set forth in detail in the Farmer patent. Farmer is determining dose. Claim 1 of Farmer, referenced by the Examiner, makes no suggestion of using the dose as an indicator of whether the input signals were valid or noisy. Rather, as set forth at the beginning of column 1, Farmer is concerned with the total exposure to radiation and is concerned with preventing overexposure and avoiding injury.

The Claims Distinguish Patentably
Over the References of Record

Claim 1 calls for a counting channel which counts a number of charge signals detected over a measurement interval. By contrast, Valenta counts a number of signals from a differentiation circuit **24** which exceed a threshold.

Second, claim 1 calls for determining the absorbed quantities of x-rays from a combination of both a count of the number of charge signals and an overall charge integration of the charge signals. By distinction, Valenta only determines a quantity of absorbed x-rays based on an integration. The differentiator circuit **22** only determines whether or not a signal is valid and enables (or disables) a pulse height analyzer from analyzing it. Thus, if the signal is invalid, no measurement of the absorbed quantity of x-rays is made by Valenta. If the pulse is valid, the quantity of absorbed x-rays is made solely from the integration path **32**.

Accordingly, it is submitted that **claim 1 and claims 2 and 4-7 dependent therefrom** distinguish patentably and unobviously over the references of record.

Claim 3 calls for a data processing unit **11** which determines the quantity of absorbed x-rays from (1) a count of the charge signals from a counter circuit, and (2) an integration of the charge within the charged signals from an integration circuit. When the absorption rate is low, the count signals are given more weight; if the absorption rate is high, the integration signals are given more weight. Thus, the quantity of absorbed x-rays is a combination of count and integration, the weighting of which combination is adjusted with the absorption rate.

Valenta makes no suggestion that a count of the number of charge signals can be used to determine the quantity of absorbed x-rays. Moreover, Valenta makes no suggestion of dynamically adjusting a weighting between count and integration values based on absorption rate.

Farmer fails to cure these shortcomings of Valenta. Farmer takes a quantity of radiation measurement from a pulse height analyzer and processes it to determine a received radiation dose. Farmer makes no suggestion of determining the quantity of x-rays absorbed from a combination of charge signal counts and charge signal integration, much less varying the weighting of these two components based on absorption rate.

Accordingly, it is submitted that **claim 3** distinguishes patentably and unobviously over the references of record.

Apparatus **claim 10** has been amended to parallel method claim 8, particularly the portions of claim 8 summarized in the Examiner's reasons for allowing claim 8. Accordingly, it is submitted that **claim 10** now distinguishes patentably and unobviously over the references of record.

Amended Formal Drawings

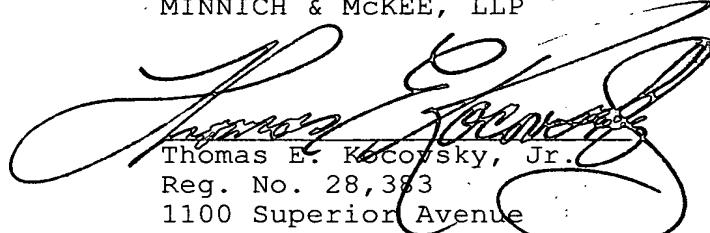
The applicants are enclosing herewith new drawings in which the boxes have been labeled. An early indication of the acceptance of these new Formal Drawings is requested.

CONCLUSION

For the reasons set forth above, it is submitted that claims 1-8 and 10 distinguish patentably and unobviously over the references of record. An early allowance of all claims is requested.

Respectfully submitted,

FAY, SHARPE, FAGAN,
MINNICH & MCKEE, LLP



Thomas E. Kacovsky, Jr.
Reg. No. 28,383
1100 Superior Avenue
Seventh Floor
Cleveland, OH 44114-2518
(216) 861-5582

CERTIFICATE OF MAILING

I hereby certify that this **AMENDMENT B** in connection with U.S. Application Serial No. 10/067,427 is being deposited with the United States Postal Service as first class mail in an envelope addressed to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450, on this 27th day of January, 2004.

By: Chilary M McNulty